TITLE

CABLE-PROCESSING MACHINE WITH SWIVELING DEVICE FOR SERVING PROCESSING STATIONS WITH CABLE-ENDS

BACKGROUND OF THE INVENTION

The present invention relates to a cable-processing machine with a swiveling device for serving processing stations with cable-ends.

The European patent application EP 02405130.2 shows a swiveling device with two swiveling arms for serving a crimping device, wherein the crimping device has a first crimping station and second crimping station, each crimping station being provided with a tool-bench with tool-stations and a crimping press. A cable is advanced by means of a belt-drive, the leading end of the cable being grasped by a first gripper which is arranged on a first swiveling arm, and which takes the cable-end stripped of insulation to the first crimping station. After the leading cable-end has been fitted with a crimped contact, the first swiveling arm moves back in the axis of the belt-drive. Following this, the belt-drive advances the cable further, until the desired length of the cable is attained. A cutting and stripping station cuts the cable-length from the cable, and strips the insulation from the cable-ends. The trailing cable-end of the cable-length is grasped by a second gripper arranged on a second swiveling arm, which takes the trailing cable-end to the second crimping station to be fitted with a crimped contact. With the tool-stations arranged on a turntable, changeover from one type of contact to another type of contact is possible with minimal downtime of the crimping press.

A disadvantage of this known device is that a swiveling arm is needed for each cable-end, even though both cable-ends are subjected to the same processing. Such swiveling devices are mechanically elaborate, and require complex means of control.

SUMMARY OF THE INVENTION

The present invention provides a remedy and a solution to avoiding the disadvantages of the above-described known device and creates a swiveling device by means of which cable-processing machines which operate more compactly can be realized. The cable-processing machine according to the present invention includes: a belt-drive for providing a cable; a cutting and stripping station for cutting a cable-length

from the cable and stripping leading and trailing ends of the cable-length; a pair of crimping presses for attaching a crimped contact to each of the leading and trailing ends; and a swiveling device positioned adjacent the cutting and stripping station and the crimping presses, the swiveling device having a swiveling arm with a gripper at one end for sequentially holding the leading and trailing cable-ends, the swiveling arm moving the leading and trailing cable-ends from the cutting and stripping station to the crimping presses and away from the crimping presses. The swiveling arm is pivotally mounted on the swiveling device at another end opposite the one end and a cable-axis of a one of the cable-ends being held extends parallel to a longitudinal axis of the swiveling arm when the one end of the swiveling arm is positioned at one of the crimping presses.

The cable-processing machine according to the present invention includes a platform, a turntable rotatably mounted on the platform with the swiveling arm being attached to the turntable, and a first drive attached to the platform and driving the turntable and the swiveling arm in rotation. The machine includes a second drive mounted on the platform and driving the swiveling arm linearly. The machine further includes a third drive mounted on the swiveling arm and driving the gripper in rotation. The swiveling device can be positioned either above or below a cable-line extending through the belt-drive.

The advantages achieved by the present invention are that the swiveling device serves the processing stations with only one swiveling arm, which supplies the processing stations with leading cable-ends and trailing cable-ends. On a cable-processing machine with the swiveling device according to the invention, expensive processing devices such as, for example, devices for the welding or laser-processing of cable-ends, only have to be provided once. Because of its simple construction, the swiveling device can be converted quickly and easily. The inexpensive and compactly constructed swiveling device allows good access to processing machines and cable storage. A leading or trailing cable-end can, for example, after the first processing be easily passed on a gripper to a further cable-processing machine.

DESCRIPTION OF THE DRAWINGS

The above, as well as other advantages of the present invention, will become readily apparent to those skilled in the art from the following detailed description of a

preferred embodiment when considered in the light of the accompanying drawings in which:

Fig. 1 is a schematic perspective view of a cable-processing apparatus in accordance with the present invention with a swiveling device arranged below a cable-line;

Figs. 2 to Fig. 6 are perspective views showing the apparatus of Fig. 1 performing the individual steps of a cable-end processing;

Fig. 7 is a schematic perspective view of the swiveling device shown in Fig. 1;

Fig. 8 is a schematic perspective view similar to Fig. 1 showing the cable-processing apparatus according to the present invention with the swiveling device arranged above the cable-line; and

Fig. 9 is a schematic perspective view of the swiveling device shown in Fig. 8.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Fig. 1 shows a cable-processing machine **1** with a swiveling device **2** according to the present invention for serving processing stations **3**, for example a pair of crimping presses **3.1**, **3.2**, with cable-ends. A belt-drive **4** serves to advance a cable **5** from a reel or drum (not shown). By means of a cutting and stripping station **6**, a leading cable-end **5.1** and a trailing cable-end **5.2** respectively of the cable **5** are cut and stripped, a cutting knife **6.1** cutting a cable-length **5.3** from the cable **5**, and a stripping knife **6.2** stripping the cable-ends **5.1**, **5.2**. After processing the leading cable-end **5.1**, the cable-length **5.3** is laid on a continuously driven cable transportation belt **7**, and the trailing cable-end **5.2** is processed. After the cable-length **5.3** has been processed, it is laid in a cable tray **8**.

In the cable-processing machine **1** of Fig. 1, the swiveling device **2** is arranged below a cable-line **5.4** represented by a broken line. For handling the leading cable-end **5.1** and the trailing cable-end **5.2** respectively, the swiveling device **2** has a gripper **2.2** arranged on a swiveling arm **2.1**. The swiveling device **2** can also serve processing stations arranged to the right of the cable-line **5.4** as viewed in the direction of transportation of the cable.

Figs. 2 through 6 show the individual steps of a cable-end processing. In Figs. 2 through 6, in the interest of better illustration of the functioning of the swiveling device **2**, the cutting and stripping station **6** is not shown. As the processing stations 3, the first

crimping press **3.1** and the second crimping press **3.2** are provided. Other processing stations such as for example, stations for welding, for laser processing, or for stripping are also possible. In Fig. 2, the gripper **2.2** of the swiveling arm **2.1** tightly holds the stripped leading cable-end **5.1**.

In Fig. 3, the swiveling movement of the swiveling arm **2.1** is symbolized by an arrow **P1**. During the swiveling movement of the swiveling arm **2.1**, the gripper **2.2** executes a rotating movement symbolized by an arrow **P2**.

Simultaneous with the swiveling movement **P1** of the swiveling arm **2.1**, the belt-drive **4** advances the cable **5**, the cable-axis of the cable-end **5.1** thereby running parallel to the longitudinal axis of the swiveling arm **2.1**. In Fig. 3, the leading cable-end **5.1** is positioned, and ready to have a crimped contact **9** crimped onto it.

After the crimping operation, the swiveling arm **2.1** as illustrated in Fig. 4 continues the swiveling movement **P1** until adjacent to the cable transportation belt **7**, the belt-drive **4** advancing the cable **5**. The gripper **2.2** is then opened, upon which by means of the moving transportation belt **7** the cable-end **5.1** is stretched, and by the belt-drive **4** advanced further to the desired length for the cable-length. Should short cable-lengths be desired (cable-lengths shorter than twice the length of the swiveling arm), the belt-drive **4** pulls the cable **5** back to the desired length of cable-length. After the gripper **2.2** has opened, the swiveling arm **2.1** swivels back into the starting position, and holds the cable **5** tight. After that, the cable **5** is cut and stripped by means of the cutting and stripping station **6**. As illustrated in Fig. 5, the trailing cable-end **5.2** is transported by means of the swiveling arm **2.1** to the first crimping press **3.1**, where it is fitted with another crimped contact **9**.

After the cable-length **5.3** has been processed, the swiveling arm **2.1** swivels as shown in Fig. 6 in the direction opposite to the swiveling movement **P1** to the cable tray **8**. After the gripper **2.2** opens, the cable-length **5.3** falls into the cable tray **8**. After this, the swiveling arm **2.1** returns to the starting position.

Fig. 7 shows details of the swiveling device **2** arranged below the cable-line **5.4**. A first drive **2.4** is arranged on a platform **2.3** and drives, for example by means of a toothed pulley **2.5**, a toothed belt **2.6** which itself drives a turntable **2.7** which is mounted rotatably on the platform **2.3**. The movement of the turntable **2.7** is symbolized by the arrow **P1**. Arranged on the turntable **2.7** is a second drive **2.8**, which by means of a

pinion engaging in a rack moves the pivoting arm **2.1** which is guided by a longitudinal guide **2.9**. The linear movement of the swiveling arm **2.1** is symbolized by an arrow **P3**. Arranged on the swiveling arm **2.1** is a third drive **2.10** which by means, for example, of a shaft **2.11** and a worm gear **2.12**, imparts rotating movement to the gripper **2.2**. The movement of the gripper is symbolized by the arrow **P2**. The movements **P1** and **P2** are explained by Figs. 2 through 6. The movement **P3** is used for positioning the gripper **2.2** in the axial direction of the cable-ends **5.1**, **5.2** in the processing stations **3**, or in the cutting and stripping station **6**.

Fig. 8 shows a cable-processing machine **1'** according to an alternate embodiment of the present invention with the swiveling device **2** arranged above the cable-line **5.4** and turned upside down. Fig. 9 shows details of the swiveling device **2** arranged above the cable-line **5.4**. The constructions of the cable-processing machine **1'** and the swiveling device **2** are comparable to the machine **1** and device **2** shown to Figs. 1 through 7.

The apparatus according to Figs. 1 through 7 allows good access to the processing machines. The apparatus according to Figs. 8 and 9 simplifies laying the cable-length in the cable tray.

In accordance with the provisions of the patent statutes, the present invention has been described in what is considered to represent its preferred embodiment. However, it should be noted that the invention can be practiced otherwise than as specifically illustrated and described without departing from its spirit or scope.